

Femto-Satellite Sensor Node Demonstration

Completed Technology Project (2013 - 2014)



Project Introduction

This innovation seeks to fill the need for capabilities to make simultaneous, distributed measurements of sun-earth interactions in low earth orbit in order to provide separation between temporal and spatial evolution of phenomena. In addition, this innovation seeks to take advantage of low-cost access to space opportunities by reducing critical spacecraft function to such a size that a cloud of distributed sensors can be included on a cube-satellite deployment system. The key challenge for reducing a traditional satellite to such a small size is to remove the maximum possible functionality that is not critical for creating a working spacecraft. This includes moving as much functionality as possible from the sensor node to a host system (e.g. mothership or ground station). This process is extremely critical of functions that consume mass, power, or volume such as attitude controllers, sophisticated sensing systems, and redundancy. Previous methods for separating spatial from temporal evolution include formations of a few large spacecraft. MMS and STEREO are examples. These prior missions have the drawback of being very expensive and being limited to only a few spatial measurements at a time. The purpose of this effort is to develop a concept for how to construct a spacecraft platform that will enable sensing systems to be reduced in size to a very small (~50cm³), wireless package that can be utilized in distributed space sensing systems, particularly for in-situ measurements. The innovations that were explored include energy harvesting and management, GPS tracking, electronic integration and mechanical packaging.

Anticipated Benefits

N/A



Femto-Satellite Sensor Node
Demonstration Project

Table of Contents

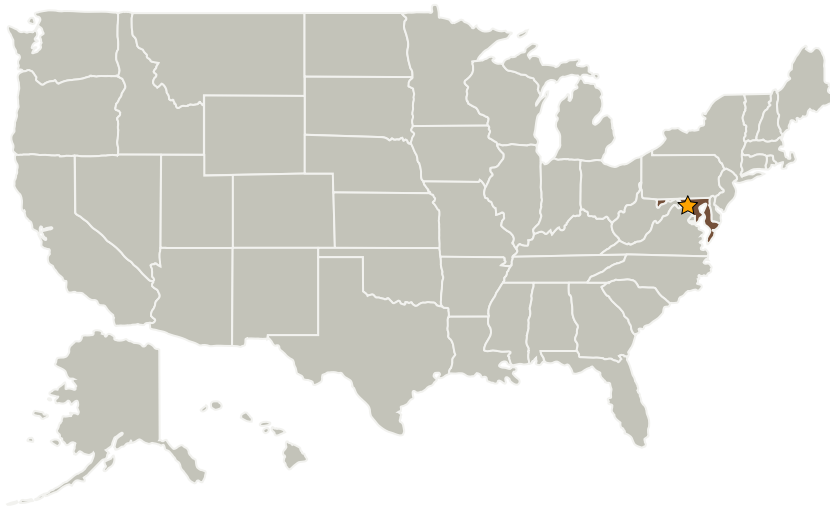
Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Images	3
Project Website:	3
Technology Areas	3

Femto-Satellite Sensor Node Demonstration

Completed Technology Project (2013 - 2014)



Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Goddard Space Flight Center (GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations

Maryland

Organizational Responsibility

Responsible Mission Directorate:

Mission Support Directorate (MSD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Center Independent Research & Development: GSFC IRAD

Project Management

Program Manager:

Peter M Hughes

Project Managers:

Wesley A Powell
Nikolaos Paschalidis

Principal Investigator:

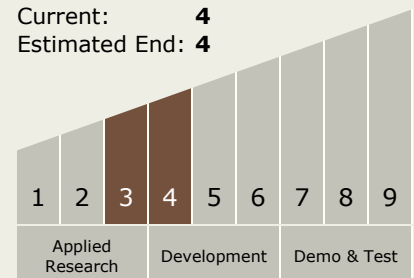
Kyle J Gregory

Technology Maturity (TRL)

Start: 3

Current: 4

Estimated End: 4



Femto-Satellite Sensor Node Demonstration

Completed Technology Project (2013 - 2014)



Images



Femto-Satellite Sensor Node Demonstration Project

Femto-Satellite Sensor Node
Demonstration Project
(<https://techport.nasa.gov/image/3990>)

Project Website:

<http://sciences.gsfc.nasa.gov/sed/>

Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
 - └ TX05.4 Network Provided Position, Navigation, and Timing
 - └ TX05.4.2 Revolutionary Position, Navigation, and Timing Technologies

Other/Cross-cutting:

- TX17 Guidance, Navigation, and Control (GN&C)
 - └ TX17.2 Navigation Technologies
 - └ TX17.2.3 Navigation Sensors